

**Cornell University Cooperative Extension Eelgrass (*Zostera marina*) Aerial  
Survey Ground-Truthing for the Peconic Estuary  
Quality Assurance Project Plan**

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Draft

*Prepared by:*

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Program Manager:

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Signature / Date  
Chris Pickerell, CCE

Project QA Officer:

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Signature / Date  
Steve Schott, CCE

Peconic Estuary Program Quality Assurance Manager:

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Signature / Date  
Alison Branco, NHDES

USEPA Project Officer:

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Signature / Date  
, US EPA Region I

USEPA QA Manager:

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Signature / Date  
, US EPA Region I

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### A3 – Distribution List

Table 1 presents a list of people who will receive the approved QAPP, the QAPP revisions, and any amendments.

**Table 1. QAPP Distribution List**

QAPP Recipient Name	Project Role	Organization	Telephone number and Email address
Chris Pickerell	Program Manager	CCE Marine Program	631-852-8660 <a href="mailto:cp26@cornell.edu">cp26@cornell.edu</a>
Steve Schott	Project QA Officer and GIS staff	CCE Marine Program	631-852-8660 <a href="mailto:ss337@cornell.edu">ss337@cornell.edu</a>
Alison Branco, Ph.D	SCDHS PEP Quality Assurance Manager	SCDHS Office of Ecology, Peconic Estuary Program	631-852-5805 <a href="mailto:alison.branco@suffolkcountyny.gov">alison.branco@suffolkcountyny.gov</a>
	USEPA Project Manager	USEPA Region 2	
	USEPA Quality Assurance Officer	USEPA Region 2	

### A4 – Project/Task Organization

The project will be completed by the Cornell University Cooperative (CCE) Extension Marine Program. Chris Pickerell is the Program Manager for CCE and is the primary contact for CCE. Chris Pickerell will be responsible for coordinating all program activities. This work is being done under contract for the Peconic Estuary Program (PEP), so the Program Manager will be accountable to the PEP Director (Alison Branco). The U.S. Environmental Protection Agency provides funding to the Peconic Estuary Program. (Who?) is the project manager for EPA.

Daily operations of the project will be managed by the Program Manager. The Program Manager will manage all field staff, be responsible for “stop/go” decisions in the field, coordinate data analysis and will be responsible for all final products. The CCE Marine Program retains intellectual property rights to the data from the project and may use these

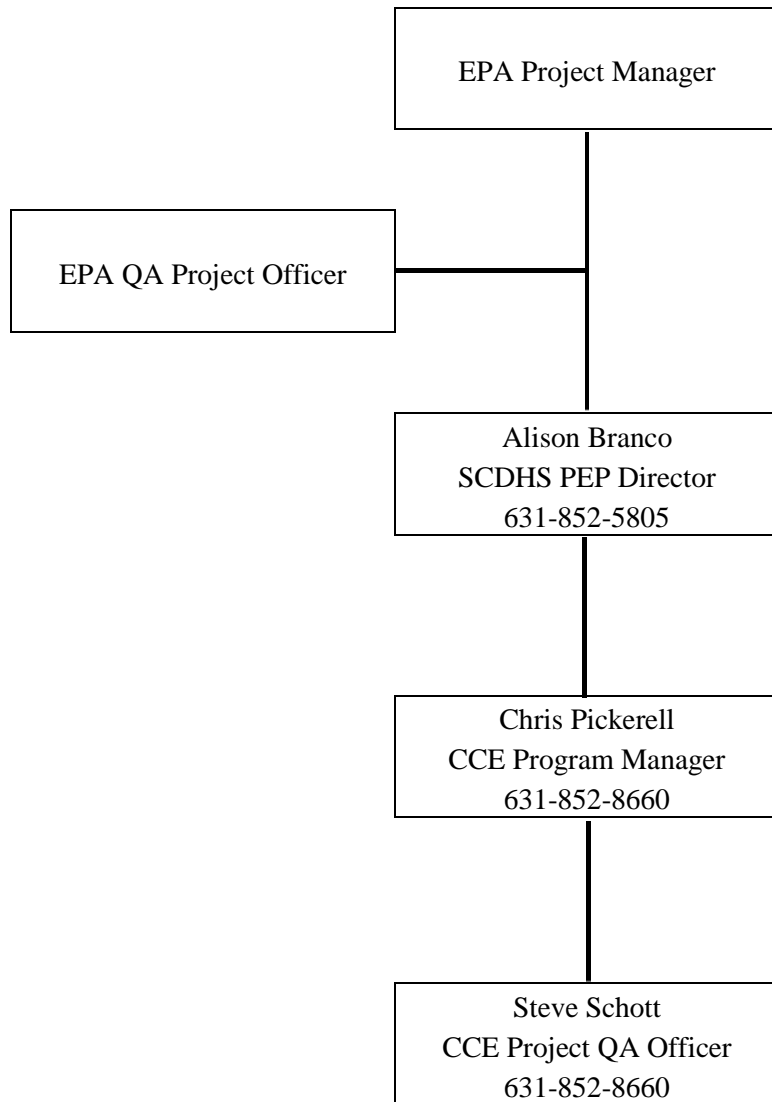
The Project QA Officer will be Steve Schott. The QA Officer will be responsible for a memorandum to the Program Manager summarizing any deviations from the procedures in the QA Project Plan, the results of the QA/QC tests, and whether the reported data meets the data quality objectives of the project. This memorandum should clearly state whether any data should be rejected because they did not pass QA tests. The Program Manager will be responsible for resolving any logistical problems.

The principal users of the data from this project will be the PEP staff, CCE and local

governments. The Program Manager will submit a report to the PEP Director at the end of the project with all the data and the QA Officer's summary report.

Figure 1 shows an organizational chart for this project.

**Figure 1. Project organizational chart**



### **A5 – Problem Definition/Background**

The decline of eelgrass (*Zostera marina* L.) in the Peconic Estuary over the last 70 years has contributed to the degradation of the estuary as a whole. This submerged, marine plant is inextricably linked to the health of the Estuary. Eelgrass provides an important habitat in near-shore waters for shellfish

and finfish and is a food source for organisms ranging from bacteria to waterfowl. To better manage this valuable resource, the Peconic Estuary Program's Comprehensive Conservation and Management Plan (CCMP) had recommended regular aerial overflights of the estuary to map the distribution of eelgrass meadows and to allow managers to identify trends in the coverage of eelgrass meadows over time.

While the final product of an aerial survey can provide an accurate estimate of the extant eelgrass coverage within an estuary, delineations made from the aerial images need to be checked for accuracy, and at times, require supplemental information. To this end, CCE will be providing the field support to groundtruth the delineations provided by Sewall ensuring the accuracy of the eelgrass coverage maps and providing additional, detailed information regarding density of eelgrass, presence of macroalgae and defining deep edges in eelgrass meadows when they are obscured in the aerial imagery by environmental conditions.

The data collected from the aerial surveys will assist the Peconic Estuary Program, the New York State Department of Environmental Conservation (NYDEC), and local town governments in planning for future conservation/management, permitting, and restoration activities throughout the Peconic Estuary.

## **A6 – Project/Task Description**

This project has four main tasks:

### **1. Prepare QA Project Plan**

A QA Project Plan for the ground-truthing of eelgrass delineations produced by an aerial survey of the Peconic Estuary, Long Island, NY. This plan must be approved by the PEP and EPA Region 2 before field work on this project begins. The QA Project Plan will be valid for

sampling in 2014 through 2015.

**2. Groundtruthing of draft photo-interpreted aerial survey**

CCE will groundtruth areas delineated during aerial survey and subsequent photo-interpretation. Using ArcGIS-based photo-interpretation draft data provided by Suffolk County/PEP, and aerial photography, determine accuracy of sea grass beds delineated and return corrected ArcGIS-based maps including any corrections to density categories, bed outlines, and correction/determination of deep edges not visible in imagery.

**3. Supplemental In-field Eelgrass Delineation**

CCE will ensure correct delineation of all existing beds that are part of PEP long-term monitoring program and Suffolk County Water Quality Protection and Restoration Program (SC WQPRP)-funded seagrass restoration work, including confirmation of presence/absence at all locations previously restored or measured during long-term monitoring projects. Additionally, CCE will delineate any other known seagrass beds that were not captured during the aerial survey to supplement the aerial data collected.

**4. Data and Accompanying Report**

CCE will submit a final report discussing the accuracy of photo-interpretation, and the usefulness of in-field delineation to supplement traditional ground truthing, including recommendations for future surveys. The report will include a thorough description of the methods used and Arc-GIS data layers showing corrected and supplemental seagrass bed delineations, including appropriate meta-data. See Section C2 for reporting requirements.

**Table 2. Project Schedule Timeline**

Activity	Dates (MM/DD/YYYY)		Product	Due Date
	Anticipated Date(s) of Initiation	Anticipated Date(s) of Completion		
QAPP Preparation	8/01/13	3/31/14	QAPP Document	4/30/14
Ground-truthing of draft delineations	8/01/14	9/30/14	Corrected GIS data	10/15/14

Supplemental In-field delineation	8/01/14	9/30/14	GIS data	10/15/14
Data and Report preparation	10/15/14	11/31/14	Ground-truthed delineations; Accuracy report	12/1/14

### A7 – Quality Objectives and Criteria

The work detailed in this plan is secondary to the acquisition and initial photo-interpretation of aerial imagery. The objective of this work is to provide verification of the initial photo-interpretation (ground-truthing) and conduct supplemental in-field delineation, as needed. No laboratory measurements will be made.

Precision: ± 5 m for eelgrass bed boundaries. ±10% for eelgrass density.

Accuracy: ± 5 m for eelgrass bed boundaries. ±10% for eelgrass density.

Representativeness: The results of the work will represent the eelgrass distribution for the entire estuary.

Comparability: The method will generally follow the standardized NOAA C-CAP protocol for mapping submerged aquatic vegetation (NOAA, 1995), specifically, the section on field surveys (Chapter 4: Guidelines for Monitoring Submerged Land Using Aerial Photography)

Sensitivity: Ground-truthing conducted by CCE will utilize SCUBA divers and/or a submersible camera to verify presence/absence and density of eelgrass in polygons produced by the photo-interpretation. Supplemental delineations of eelgrass meadows missed by the initial survey will be conducted using GPS with an uncorrected accuracy of ± 3 meters.

Completeness: A complete aerial survey of the Peconic Estuary will be conducted with at least 50 percent of the polygons produced during photo-interpretation will be groundtruthed.

### A8 – Special Training/Certification

CCE Habitat Restoration staff have extensive training and experience in eelgrass monitoring and conducting underwater research. Further training will be given to staff participating in this project which will cover procedures and data collection specific to this project. Training requirements for personnel participating in this project are listed below.

**Table 3. Special Personnel Training Requirements**

Project function	Description of Training	Training Provided by	Training Provided to	Location of Training Records
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SCUBA Certification	Certification in SCUBA diving with minimum requirement of entry-level diver certification	Approved certifying organization (e.g. PADI, NAUI, SDI, etc.)	All project staff.	Dive Safety Officer, CCE.
American Academy of Unwater Sciences Certification	SCUBA divers must meet the Standards for Scientific Diving as set forth by the AAUS	CCE Dive Safety Officer and Certified Instructors	All project staff.	Dive Safety Officer, CCE.
Eelgrass ground-truthing methods	Instruction on data collection and recording for ground-truthing efforts and for supplemental in-field eelgrass delineation	Program Manager and/or Program QA Officer	All project staff.	Program Manager and included in final report

## **A9 – Documents and Records**

### QA Project Plan

The Program Manager will be responsible for maintaining the approved QA Project Plan and for distributing the latest version to all parties on the distribution list in section A3. A copy of the approved plan will be on file at the PEP office in Yaphank, NY and the CCE office in Southold, NY.

### Reports to Management

The Program Manager will provide a final report to the PEP Director. The final report will discuss the accuracy of the initial photo-interpretation, the usefulness of in-field delineation to supplement traditional ground truthing, and recommendations for future surveys. The report will include a thorough description of the methods used and GIS shapefiles of all corrected and supplemental seagrass bed delineations, including appropriate meta-data.

### Archiving

The QA Project Plan and final report will be kept on file with the PEP and CCE for a minimum of 10 years after the publication date of the final report.

## **B1 – Sampling Process Design**

Images will be acquired with a 60% overlap. Groundtruthing requirements are discussed in Sections B2 and B5.

## **B2 – Sampling Methods**

Ground-truthing observations are made from a small boat within 1-2 months of the date of the overflight. The Project Manager is supplied with aerial imagery that includes draft delineations of polygons thought to be eelgrass. The Project Manager, or trained staff, navigates to delineated areas in the estuary and checks for the presence of eelgrass and its approximate cover. The presence of macroalgae in these areas is also noted. Observations are recorded in a field notebook. Specific locations are recorded with a hand-held GPS unit. The observations are used to verify eelgrass beds delineated from the aerial imagery. For eelgrass beds whose deep edge is indistinct in the aerial photography, due to depth or water clarity, a divers will be deployed to mark the deep edge with a series of buoys. The location of each of the buoy-marked locations will be recorded with a hand-held GPS unit.

In 10 locations in the estuary, the Project Manager delineates the boundary of an eelgrass bed using a hand-held GPS and a small boat. At least 50 meters of boundary are mapped in each of these locations. These boundaries are compared to boundaries mapped from the aerial imagery to determine the accuracy of the photo interpretation methods.

### **B3 – Sample Handling and Custody**

No water quality or biological samples will be collected.

### **B4 – Analytical Methods**

No laboratory analytical method will be used. The maps provided by the eelgrass aerials survey and initial photo-interpretation are adjusted and/or verified using ground-truthing data (see section B5).

### **B5 – Quality Control**

The quality of the photo-interpreted eelgrass bed boundaries is checked using ground-truth observations. The 10 bed boundaries mapped using a hand-held GPS (see section B2) are mapped on top of the eelgrass polygons using GIS software. For each of the 10 bed boundaries, the distance between each GPS point and the photo interpreted boundary is calculated. The average distance for all the GPS points in each boundary is then compared to the data quality objectives for precision and accuracy of +/- 5 m.

The groundtruthing observations of eelgrass and macroalgae presence in different locations are used to check the photo-interpreted maps for accuracy.

### **B6 – Instrument/Equipment Testing, Inspection, Maintenance**

Not applicable.

### **B7 – Instrument/Equipment Calibration and Frequency**

Not applicable.

## **B8 – Inspection/Acceptance Requirements for Supplies and Consumables**

Not applicable.

## **B9 – Non-direct Measurements**

Not applicable.

## **B10 – Data Management**

GIS files of the eelgrass ground-truthing will be processed by the CCE GIS staff and then provided with appropriate metadata to Sewell for analysis and incorporation into the final eelgrass maps for the estuary. The report on the analysis of the accuracy of the eelgrass delineations and the addition of eelgrass beds not identified in from the aerial photography will be submitted to Sewell and to the PEP office for archiving.

## **C1 – Assessments and Response Actions**

Review and assessment of all aspects of this project is the responsibility of the Program Manager. The Program Manager will be involved with all aspects of this project. If problems occur, appropriate adjustments will be made. All such changes will be recorded and reported to the Peconic Estuary Program Quality Assurance Manager, immediately.

The Project Manager is specifically responsible for assessing that the data quality objectives from section A7 have been met. The precision and accuracy objectives are assessed using the methods from Section B5. The representativeness and completeness objectives are assessed based on whether complete maps of the entire estuary were generated. The comparability and sensitivity methods are assessed based on whether the methods from the QAPP were followed or if there were non-conformances. The results from all of these assessments will be summarized in the final report (see reporting requirements in section C2).

## **C2 – Reports to Management**

The Program Manager will provide the following electronic reports to the PEP, Sewell, and EPA:

- Initial Field Report (due by September 15, 2014): A written summary of the results of the ground-truthing data collected. Also included will be the GIS data collected during the ground-truthing regarding the presence of eelgrass/macroalgae, density estimates for delineated polygons, and GPS-generated edges of beds not initially identified in the analysis of the aerial imagery or beds whose deep edges were obscured by poor water clarity or by water depth.
- Final Report (due by November 1, 2014): The final work product will consist of:

- A final report discussing the accuracy of the photo-interpretation and the usefulness of in-field delineation to supplement traditional ground truthing, including recommendations for future surveys will be submitted. The report will provide details on the methods used in the field survey and discuss the corrected and supplemental eelgrass bed data collected during the ground-truthing stage.
- A GIS shapefile of the corrections and supplemental eelgrass delineations added to the initial draft of the eelgrass map provided by Sewell for the Peconic Estuary, including a metadata file.
- Copies (or scans) of notebook pages containing ground-truthing observations and of hand-held GPS coordinates.

### **D1 – Data Review, Verification and Validation**

The Project QA Officer will review the methods used to acquire, process, and interpret data on eelgrass distributions in the Peconic Estuary to verify that the methods follow the procedures outlined in this QA Project Plan (Sections A7, B1, B2, B3, B4, and B5). The Project QA Officer will be responsible for a memorandum to the Program Manager summarizing any deviations from the procedures in the QA Project Plan and the results of the QA/QC tests.

### **D2 – Verification and Validation Procedures**

The Program Manager reviews the memorandum from the QA Officer to see if there have been deviations from the QA Project Plan. Any decisions made regarding the usability of the data will be left to the Program Manager; however, the Program Manager may consult with project personnel, the PEP Quality Assurance Manager, or with personnel from EPA-Region 2, if necessary.

### **D3 – Reconciliation with User Requirements**

The Program Manager will be responsible for reconciling the results from this study with the requirements of the study (the ultimate use of the data). Results that are qualified by the Project QA Officer may still be used if the limitations of the data are clearly reported to decision-makers. Data for this project are being collected as part of a long-term monitoring program. It is not possible to repeat sampling events without disrupting the time series. Therefore, the Program Manager will:

1. Review data with respect to sampling design.
2. Review the Data Verification and Validation reports from the Project QA Officer.
3. If the project objectives from Section A7 are met, the user requirements have been met. If the project objectives have not been met, corrective action as discussed in D2 will be established by the Program Manager prior to the next monitoring event.
4. Draw conclusions from the data.